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**APPLICATION FOR UNITED STATES  
LETTERS PATENT**

**METHOD AND APPARATUS FOR REMOTELY ACCESSING A PASSWORD-  
PROTECTED SERVICE IN A DATA COMMUNICATION SYSTEM**

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## **BACKGROUND OF THE INVENTION**

### **1. Field of the Invention**

The present invention relates to a method and arrangement for remotely accessing  
5 password-protected services in a data communication system.

### **2. Description of Related Art**

Reliable identification of the user is an essential prerequisite for permitting access  
to many services, such for example as bank services, that are commonly provided in a general  
10 telecommunication network or other data network. Because the use and consequences of use of  
such services may involve significant economic ramifications, it is essential that the service  
provider be able to ascertain and validate a user's identity, and/or the user's right to access and  
use the service, before making the service available to that user.

Very often, e.g. in conjunction with bank services, the identification of the user is  
15 effected and confirmed by means of passwords, and often these passwords are expendable. In  
commonly-used arrangements, the service provider or an identifying party authorized by the  
service provider has given the user beforehand a number of single-use passwords (e.g. four-digit  
numbers), one of which the customer uses each time he or she needs to access or use the service.  
When the previously-provided list of passwords is or is about to be exhausted, the service  
20 provider (or a party authorized by the service provider) sends the user a new list of passwords. In

this manner, the user always has a sufficient number of passwords on hand to satisfy his or her near-future needs.

A feature typical of prior-art solutions is that the user or customer is required to manually input an expendable password when logging on to the bank's or service-provider's server. Often the password is entered by selectively depressing the keys of a telephone set, thereby causing the data to be transmitted to the server using tone frequency transmissions employing the so-called DTMF (dual tone multifrequency) codes. In addition, there are many other methods for transmitting a password, such as the short-message service available in GSM (Global System for Mobile Communications) networks; as used herein, the term GSM network is intended to refer to any mobile communication system based on the GSM specifications. In any event, the essential point is that the user is required to manually input the password which is time consuming and, in many cases, may be quite difficult for the user.

Another feature typical of prior art solutions is that the service provider must from time to time provide the user with a new set of passwords by using a relatively unreliable transmission mechanism, most commonly by mail. In such situations the letter containing the passwords may end up in the wrong hands, thus compromising security.

## OBJECTS AND SUMMARY OF THE INVENTION

It is accordingly the *desideratum* of the present invention to overcome the problems and difficulties inherent in prior art systems and practices as described hereinabove.

5 It is a specific object of the invention to provide a completely new procedure and system for effecting the transmission of passwords between a user's telephone apparatus and a service-provider's server.

10 A further object of the invention is to facilitate the use of remotely-accessible services that require passwords by reducing the number of routines that necessitate user interaction to attain access to and use the services without compromising the safety and security of the services.

15 The procedure of the invention for accessing a service in a data communication system is intended for use in systems in which the service provider provides to the user of a service a number of expendable passwords by means of which the user can access the service via a telecommunication and/or data network, a connection is set up from a terminal device to a server and a password is sent or supplied to the server at log-on to the service, the password is identified and verified by the server, and access to the service is then allowed or denied based on the supplied password.

20 In accordance with the inventive procedure, a set of passwords is stored in the terminal device, the proper or appropriate password is selected from the stored set of passwords

at log-on to a predetermined service, and the selected password is automatically added to a connection setup signal or string for transmission from the terminal device to the server.

Correspondingly, in the inventive system, the terminal device comprises means for storing a set of passwords and for selecting the proper or appropriate password from the stored set of passwords at log-on to a predetermined service for automatic addition of the password to a connection setup signal or string which is then transmitted from the terminal device to the server.

The present invention advantageously provides a completely new type of mechanism for the transmission of passwords between a user's terminal -- such as a telephone set or device or apparatus -- and a server of the application or service provider. A further advantage of the invention is that it facilitates access to and use of services that require passwords for access by reducing the number of routines that necessitate user interaction in conjunction with attaining access to and use of the services. This is accomplished without any compromise in the safety or security of the services.

In one or various embodiments of the inventive procedure, a number of features are or may be implemented. For example, used passwords from the stored set of passwords may be registered or recorded. In addition, the set of passwords in the terminal device may be updated from the server via the telecommunication and/or data network. Furthermore, an order or request for a new set of passwords may be automatically sent to the server from the terminal device when the previous set of passwords has been exhausted. It is also contemplated that several sets of passwords corresponding to the different services may be stored in the terminal device and,

during or in connection with setup, the particular set of passwords corresponding to and for use with each service to be accessed is automatically selected.

Similarly, a number of features are intended for implementation in one or more embodiments of the inventive system. Thus, the terminal device may include or comprise means for registering or recording those of the passwords in a set of passwords that have already been used. The server may comprise means for updating the set of passwords in the terminal device via the telecommunication and/or data network, and the terminal device may comprise means for receiving a set of passwords from the server or other remote source via the network. The terminal device may additionally comprise means for automatic ordering, via the network, of a new set of passwords from the server when the previous or existing stored set of passwords has been exhausted.

The terminal device may also comprise means for storing several sets of passwords each corresponding to or for use with one of a plurality of different services accessible by the user, and it may furthermore comprise means for automatically selecting the appropriate particular set of passwords corresponding to or for use with each specific service to be accessed or used.

In the practice of the invention, the data communication system may comprise a wired network and the terminal device a telecommunication terminal, such as a telephone, in the wired network. In some embodiments of the system, the data communication system comprises a mobile communication network, such as a GSM network, and the terminal device is a mobile station, such as a GSM telephone. Where the terminal device is a GSM telephone, the means for

implementing and utilizing the password management functions may be disposed in a subscriber identity module, such as a SIM card, in the form of programming or software operable to perform the intended operations and functionality.

5 In the same or other embodiments of the inventive system, the transmission of  
passwords in the connection setup between the subscriber identity module and the service may be  
effected by making use of the subscriber number. The software of the subscriber identity module  
may be designed to identify the service on the basis of its identifier data, such as the telephone  
number used to access the service, and to add or append a predetermined number of additional  
10 digits forming or providing the appropriate password to the end of the telephone number of the  
service during call setup. The subscriber identity module may furthermore be provided with or  
store a service directory containing information specifying the services, the service identifier data  
and the names of the password files to be used in conjunction with the particular services. Such  
service directory may also be provided with a pointer for each service, the pointer being arranged  
to point to the first unused password in the set of passwords and, after that password has been  
15 used, to move on or be incremented to then point to the next unused password in sequence.

In further accordance with the inventive system, the mechanism for ordering new passwords and for transmitting them between the server and the subscriber identity module may comprise or utilize the short-message service (SMS-PP service) of a GSM network.

20 Other objects and features of the present invention will become apparent from the  
following detailed description of the invention as applied to preferred embodiments thereof.

**DETAILED DESCRIPTION OF THE CURRENTLY PREFERRED EMBODIMENTS**

5 The invention has for its basis the provision in or to a terminal device in a data communication system -- as for example a wired or mobile telephone set or apparatus -- of an extra module, either physical or logical, implementing operative functionality that creates or inserts additional signals in the communication between the telephone apparatus and the server in conjunction with a connection setups signal or procedure related to a service, and/or additional fields and/or components or equivalent in the communication between the telephone apparatus and the server. An expendable password, required to obtain access to the service, is in accordance with the invention transmitted in these additional signals or fields or components. This password transmission is carried out automatically without user action or intervention or, indeed, awareness. The module registers or records each password that is used and therefore always knows which is the correct password to be used for each particular log-on. The user will find this type of service notably easier and less intrusive to use, but in respect of data security it provides substantially the same level of security as services in which the user must manually input the necessary password(s). The additional module is also able or operable to receive new passwords from the server and to order or initiate a request to the server for new passwords when necessary.

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20 This module in the telephone apparatus may furthermore support simultaneous access to multiple services each requiring expendable passwords. For this purpose, the additional module of the invention may contain a directory of supported services -- in short, a service directory -- which is used to identify, in a user's attempt to initiate a remote access connection,

that the attempted connection is to a service that requires expendable passwords and to locate the correct list of passwords for that service and, in addition, to locate the correct position in the password list so that the proper password is transmitted to the service for access.

The preferred embodiment of the inventive system comprises a mobile station,  
5 such as a GSM telephone, whose subscriber identity module (SIM) contains a software-based application that uses SIM Application Toolkit commands to accomplish and provide, in conjunction with an otherwise substantially-conventional GSM telephone or the like, the additional functionality provided in accordance with the invention, as for example described hereinabove.

10 The password transmission mechanism employed in conjunction with the setup of a service connection between the SIM card and the remote server of the service provider uses, in a preferred embodiment, the called-subscriber number, i.e. the so-called B-identifier. The application on the SIM card uses the "Call Control by SIM" command as defined in the TS GSM 11.14 specification, and in practice the inventive application processes each called-subscriber number; in other words, it compares the called-subscriber number with the numbers stored in the  
15 service directory and, when it detects that a call is addressed to one of the stored numbers (i.e. one of the numbers associated with a service requiring a password to attain access), it appends to the end of the telephone number a required or predetermined number of additional digits in which the expendable password is encoded or otherwise represented. For example, when the user is making a call to the number 0800-XYZ-123456, and that number is identified by the inventive  
20 application as one present in the stored listing of numbers, the application on the SIM card will

change the number to the form 0800-XYZ-123456-KLMN, which the last four digits (KLMN) of the modified number are or represent the expendable password that is added by the SIM card.

The service directory may be implemented as a special file on the SIM card. The special file contains information specifying the services supported, their identifier data and the names of the password files to be used in conjunction with the various supported services. Moreover, for each service, the service directory contains a pointer that points to the current position in the corresponding locally-stored list of passwords. Table 1 presents an example of the information elements that may be included in this special file.

With specific reference to Table 1, and by way of illustrative example, service 1 is identified in accordance with the invention from the fact that the user is calling the number 0800123. The application knows that it must append to the end of that number an expendable password, which password is found in the file 2FF5 that contains a total of 100 passwords. In this instance, and at this time, the current password to be used is the thirteenth one listed in the file 2FF5.

Service Identifier	Method	Identifiers Associated With Method	Name of Password File	Pointer	Total Number of Passwords
1	BID	0800123	2FF5	13	100
2	BID	0800456	2FF4	11	100
3	SMS	SMSC: +02 0202800 BID:8756	2FF6	2	9

Table 1. Service directory as used in an embodiment of the invention

The server in the public telecommunication network thus receives the expendable password in the signaling data transmitted through the telephone network. The server takes the last four digits of the B-identifier and assumes that they constitute or provide an expendable password. The server then compares the expendable password thus obtained with its own information as to what *should* be the user's next password. This extraction of the password digits and comparison with its own stored data may be carried out by any currently-known or otherwise suitable methods.

If the particular service requires the use of a user name at log-on to the service, the service directory may additionally contain stored user names for each listed service. The user name may, for example, also be appended to the connection setup signal in the same manner as the password.

To effect the transmission of new passwords between the server and the inventive software-based application on the SIM card, the SMS-PP (short messaging) service of the GSM network may be employed. Transmission by the SIM card of an order for new passwords may be carried out using the SMS-PP/MO (Mobile Originated) service with the passwords then transmitted to the SIM card using the SMS/PP-MT service.

The functionality of the inventive application may be divided between three operative modules. The first module, an appending module, recognizes -- as from the subscriber number used to access the service -- the need to add an expendable password and sends a request to locate the password to a password search module. Once the search module has identified the

proper or appropriate password, the appending module appends the expendable password that it has received to the B-identifier and allows the call to further proceed from the telephone apparatus.

In the most preferred embodiment of the invention, the third module, for adding  
5 new locally-stored passwords for use in accessing one or more remote services, operates completely independent of the other modules. In practice, it monitors the SMS Data Download traffic consistent with TS GSM 11.14 version 5.1.0 as received by the SIM card and detects the appearance of new passwords on the card. The module for adding new passwords stores the new passwords received in the SMS Data Download message to a suitable special file on the SIM card  
10 and enters an appropriate addition to the service directory to enable the search block to locate the new passwords. This new password file may comprise a combination that contains the last unused passwords of the previous file and the completely new passwords just received.

Those skilled in the art will appreciate that the various functions and operations performed by or at the user's terminal device are generally anticipated and intended for  
15 implementation in software operatively utilized in conjunction with otherwise substantially conventional hardware. Likewise, the server functionality required or appropriate to support and in accordance with the invention will generally be implemented in software at the server. In a GSM telecommunication system in which the terminal device comprises a mobile telephone handset, the software implementing the inventive terminal operations and functionality may in a  
20 preferred embodiment be carried or stored on the SIM (subscriber identity module) card associated or used with the mobile handset which may in other respects be of conventional

construction. Although the invention may alternatively be practiced using dedicated hardware modules forming a part of the terminal device and constructed specifically for performing the respective operations that characterize the invention, in preferred forms of the inventive method and apparatus such functionality is implemented through programming or software that is operable  
5 to carry out those operations. In either case, the particular details and design of the hardware or software is substantially a matter of design choice and its construction and/or design is, given the within disclosure of the invention, considered to be well within the ordinary abilities of those skilled in the relevant arts. No specific disclosure of suggested construction or design details is accordingly provided herein or deemed necessary to enable ready practice of the invention.

10 Thus, while there have shown and described and pointed out fundamental novel features of the invention as applied to preferred embodiments thereof, it will be understood that various omissions and substitutions and changes in the form and details of the methods described and devices disclosed, and in their operation, may be made by those skilled in the art without departing from the spirit of the invention. For example, it is expressly intended that  
15 all combinations of those elements and/or method steps which perform substantially the same function in substantially the same way to achieve the same results are within the scope of the invention. Moreover, it should be recognized that structures and/or elements and/or method steps described in connection with any disclosed form or embodiment of the invention may be incorporated in any other disclosed or described or suggested form or embodiment as a general  
20 matter of design choice. It is the intention, therefore, to be limited only as indicated by the scope of the claims appended hereto.